

## ABSTRACT

A process for controlling the performance of a homogeneous charge compression (HCCI) engine in a vehicle having a hydrocarbon fuel reservoir which process is provided. The octane or cetane number of hydrocarbon fuel being supplied to the HCCI engine is adjusted by: (a) converting a portion of hydrocarbon fuel from the hydrocarbon fuel reservoir to synthesis gas; (b) converting synthesis gas produced in step (a) to a mixture of hydrocarbons having an octane number less than or a cetane number higher than that of the hydrocarbon fuel of the hydrocarbon fuel reservoir using a Fischer Tropsch process; (c) delivering (i) a portion of hydrocarbon fuel from the hydrocarbon fuel reservoir and (ii) a portion of the mixture of hydrocarbons produced in step (b) to the HCCI engine; and (d) varying the amounts of (i) and (ii) in step (c) in order to adjust the octane or cetane number of the hydrocarbon fuel being supplied to the HCCI engine. Apparatus suitable for carrying out this process is also disclosed.